

A Retrospective Study to Evaluate the Outcomes of Patients Admitted in the ICU with Regard to Pregnancy Status, Source of Admission and Comorbidities Leading to Admission to ICU

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Abstract

Aim: To evaluate the outcomes of patients admitted in the ICU with regard to pregnancy status, source of admission, and comorbidities leading to admission to ICU in a tertiary care in Bihar region.

Methodology: A retrospective study was undertaken for all obstetric patients admitted to the ICU of DMCH, Darbhanga, Bihar, India for 1 year. The admission criteria for the ICU included patient's need for respiratory support, intensive therapy, or monitoring. The decision for admission is made by joint consultation from critical care team, anesthesiologist, and primary team. Inclusion criteria: All obstetric patients defined as pregnant at time of admission to ICU or delivered within 6 weeks prior to admission. The data were reviewed through ICU log sheet, electronic medical records, and online laboratory data. The data collected included patient demographics, pregnancy status at the admission to critical care (whether antenatal or post natal period), mode of admission (either through emergency or from within the hospital), length of stay in the critical care, laboratory investigation at the time of admission in ICU, type of disease responsible for admission in the ICU, and outcomes in terms of death or survival.

Results: Data were collected for a period of 1 year During this period, 50 patients admitted to ICU were pregnant at the time of admission or delivered within 6 weeks prior to admission. Median age was 31 years with a range of 24-37 years. All the patients stayed in ICU for 1-3 days with a median of 2 days. There were 84% (42/50) of patients who required ventilator support; of them, 6 (12%) patients expired and 44 (88%) survived. There were more patients admitted in the ICU in the postnatal period when compared with the antenatal period; however, there was no statistical difference in their outcome. A difference in the outcome was observed for patients admitted through emergency compared with those admitted from within the hospital, with a statistically significant ($P = 0.0005$) increase in the mortality rate of patients admitted through emergency. There was no statistically significant difference in the mortality rate of patients with different presenting illnesses. A majority (48%) of the ICU admission were due to hemorrhagic/hematological causes followed by cardiovascular causes (32%).

Conclusion: Awareness should be created among the population regarding the importance of adequate antenatal care, detection of danger signs of various obstetric complications and need for contacting medical facilities in case of emergency situations. Obstetric ICU dedicated for the management of only obstetric patients should be constructed in order to compensate for heavy burden critically ill women.

Keywords: ICU, obstetric complications, pregnancy

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Introduction

Obstetric patients are usually young and healthy and mostly go through pregnancy and labor uneventfully. However, small proportion of these women will require admission to the intensive care unit (ICU), and provision of this care is a matter of life and death for them. Most women who ultimately require critical care have no prior risk factor, indicating toward a very important fact that the risk of serious maternal morbidity is relevant to all pregnancies and not only for patients who are considered high risk [1].

These patients may present with preexisting diseases which further aggravates during pregnancy or acute diseases which may or may not be specific to pregnancy. The outcome of obstetric patients admitted to ICU depends on their presenting illness, current status at time of admission, and facilities available in the ICU [2].

Pregnancy is a special physiological condition in a woman's life but sometimes could have detrimental effect to the extent of severe maternal morbidity or mortality. The critically ill obstetric patient represents a challenge that usually requires a multidisciplinary approach. Lack of awareness and the absence of regular antenatal care make the critically ill patients to be referred late and sometimes in moribund conditions. In order to provide them specialized care and reduce maternal mortality and morbidity, specialized obstetric intensive care units and high dependency units need to be established. Evaluation of obstetric admissions to intensive care unit (ICU) is one of the ways to approach surveillance of critically ill women in pregnancy in a tertiary care facility [3].

Data from developed countries show an ICU admission rate of 0.1–1.7% [4]. Critically ill obstetric patients account for as much as 7% of the ICU admissions in developing countries, while they account for only 0.2%–0.9% in developed countries.^[3,4] The reason for small percentage of ICU admission in developed countries is because of easy access to specialized centers for obstetric services and better healthcare facilities [5]. One study done in Finland shows critical care admission of obstetric patients to be in the range of 0.7%–2.1% per 100 deliveries with 0% mortality [1]. In contrast, one study from the tertiary care government institute in South India, catering to 1.7 million patients per year, shows admission of obstetric patient to be around 11.6% of total admission to critical care [6]. The aim of this retrospective analysis is to review the outcomes of patients admitted in the ICU with regard to pregnancy status, source of admission, and comorbidities leading to admission to ICU.

Materials and Methods:

A retrospective study was undertaken for all obstetric patients admitted to the ICU of DMCH, Darbhanga, Bihar, India for 1 year.

Methodology

The admission criteria for the ICU included patient's need for respiratory support, intensive therapy, or monitoring. The decision for admission is made by joint consultation from critical care team, anesthesiologist, and primary team. Inclusion criteria: All obstetric patients defined as pregnant at time of admission to ICU or delivered within 6 weeks prior to admission.

The data were reviewed through ICU log sheet, electronic medical records, and online laboratory data. The data collected included patient demographics, pregnancy status at the admission to critical care (whether antenatal or post natal period), mode of admission (either through emergency or from within the hospital), length of stay in the critical care, laboratory investigation at the time of admission in ICU, type of disease

responsible for admission in the ICU, and outcomes in terms of death or survival.

Results:

Data were collected for a period of 1 year. During this period, 50 patients admitted to ICU were pregnant at the time of admission or delivered within 6 weeks prior to admission. Median age was 31 years with a range of 24-37 years. All the patients stayed in ICU for 1-3 days with a median of 2 days.

Table 1: Demographics and laboratory findings

Variables	Median (Range)
Age (in years)	31 (24-37)
ICU stay (in days)	2 (1-3)
Hb (gm/dL)	9.7 (8.23-11.10)
WBC (10 ⁹ /L)	14.6 (8.45-18.04)
Creatinine (mg/dL)	0.84 (0.25-1.42)
Platelets (10 ⁹ /L)	140 (75-205)
International normalized ratio	1.2 (0.9-1.5)

There were 84% (42/50) of patients who required ventilator support; of them, 6 (12%) patients expired and 44 (88%) survived. Table 2 summarizes the outcomes of obstetric patients admitted to ICU in relation to their pregnancy status as whether they required ICU admission during the antenatal or postnatal period and their source of admission either through emergency or from within the hospital. There were more patients

admitted in the ICU in the postnatal period when compared with the antenatal period; however, there was no statistical difference in their outcome. A difference in the outcome was observed for patients admitted through emergency compared with those admitted from within the hospital, with a statistically significant ($P = 0.0005$) increase in the mortality rate of patients admitted through emergency [Table 2].

Table 2: Outcome of patients in relation to pregnancy status and source of admission to the intensive care unit

Variables		Total (n=50)	Expired (n=6)	Survived (n=44)	p-value
Antenatal status	Antenatal	9 (18%)	2	7	0.134
	Postnatal	41 (82%)	4	37	
Source of admission	Emergency	7 (14%)	4	3	0.005
	Operating rooms or wards	43 (86%)	2	41	

Comparison of outcomes of patients with different presenting illnesses requiring admission to the ICU is shown in Table 3.

There was no statistically significant difference in the mortality rate of patients

with different presenting illnesses. A majority (48%) of the ICU admission were due to hemorrhagic/hematological causes followed by cardiovascular causes (32%).

Table 3: Comparison of outcomes of patients with different presenting illnesses requiring admission to the intensive care unit

Complications	Total (n=50)	Expired (n=6)	Survived (n=44)	P-value
CVS	16 (32%)	2	14	0.128
Cardiomyopathy	4	1	3	
Mitral stenosis	2	0	2	
IHD	1	0	1	
Pre-eclampsia	1	0	1	
Eclampsia	5	1	4	
PIH	3	0	3	
Respiratory	1 (2%)	0	1	0.211
Pneumonia	1	0	1	
Renal (AKI)	4 (8%)	1	3	0.092
Hematological	24 (48%)	2	22	0.827
APH	2	0	2	
PPH	18	0	18	
Dengue	1	1	0	
DIC	2	1	1	
Low PLT	1	0	1	
CNS	2 (4%)	1	1	0.382
Meningitis	1	0	1	
Stroke	1	1	0	
GI	3 (6%)	0	3	0.999
Liver failure	1	0	1	
Cirrhosis	1	0	1	
Hepatic Encephalopathy	1	0	1	
Ventilator	42 (84%)	6	36	0.337

Discussion:

With the advent of invasive hemodynamic monitoring technology, approaches to critical care in obstetric patients, particularly those with preeclampsia, have received significant attention [7]. There are multiple publications describing the technique, indications, complications, and parameters of pulmonary artery catheter use in obstetric patients. However, to our

knowledge, there is only one study that has systematically reviewed obstetric patients who required critical care [8]. In that study, patients were admitted to an obstetric intensive care unit (ICU) located on the labor and delivery floor. Therefore,

it included many patients admitted simply for close observation and only a minority admitted for major organ system dysfunction. Thus, there are limited data

available on the obstetric patient who becomes critically ill antepartum or postpartum.

The results from this study showed a significant improvement in the mortality rate from obstetric hemorrhage when compared with previous report from the same institution (2.7% vs. 12%).[2] Morbidly adherent placenta (MAP) was found to be the cause of hemorrhage in a majority of the cases in this study (48%) and in a previous study (33%) from the same institution.[2] The rising trend of repeat cesarean section has been implicated as a cause of MAP and obstetric ICU referrals [9].

An overall decline in mortality (12% vs. 21.6%) was also observed in critically ill obstetric patients compared with a previous report from the same institution.[2] The cause of mortality was highest in patients admitted with eclampsia (37.5%) followed by cardiomyopathy and complications such as DIC, acute respiratory distress syndrome, sepsis, and intracranial bleed.

The mortality was significantly associated with mode of admission as six out of eight patients who died were referred from other hospitals and admitted through emergency. The results are comparable to the study done in the tertiary care government hospital of south India, where high mortality was associated with referred patients from peripheral hospitals.[6] Unfortunately, many peripheral hospitals in developing countries are unequipped to deal with the obstetric emergencies, and by the time these patients reach tertiary care hospitals, they already have high APACHE and predicted mortality.[6]

There exists heterogeneity in access to healthcare system of low- and middle-income countries. This is often apparent in countries having a two-tiered system consisting of both public hospitals and

private hospitals, with mean cost of \$3300 for receiving treatment in the critical care unit.[2] The findings of this study done in private care tertiary hospital reveal an overall improvement in the mortality of critically ill obstetric patients, but the data are not an overall representation of a developing country.

82 % of the women admitted to the ICU in this study were postpartum. There are at least two possible explanations for this finding. It is well-known that in the postpartum period, there are significant hemodynamic changes, including a 65 percent increase in cardiac output, acute blood loss at delivery, and a decrease in plasma protein oncotic pressure [10-13]. It is obvious that these cardiovascular dynamics may exacerbate symptoms in patients with underlying cardiovascular or pulmonary dysfunction whether of medical or obstetric origin. A second possible explanation for the higher number of postpartum ICU admissions reflects a reluctance to move a pregnant woman away from the expertise of obstetric personnel, unless it is absolutely necessary.[14]

The most common reasons for ICU admission in this study were obstetric hemorrhage, hypertension and its complications. A lot of issues need be addressed at different levels of patient care. A multidisciplinary team approach is appropriate in obstetric critical care settings. In addition to timely referral, health education and training of health professionals may improve clinical outcome and better obstetric practice, especially in countries like India.

Conclusion:

Awareness should be created among the population regarding the importance of adequate antenatal care, detection of danger signs of various obstetric complications and need for contacting

medical facilities in case of emergency situations. Obstetric ICU dedicated for the management of only obstetric patients should be constructed in order to compensate for heavy burden critically ill women.

References:

1. Heinonen S, Tyrväinen E, Saarikoski S, Ruukonen E. Need for maternal critical care in obstetrics: A population-based analysis. *Int J ObstetAnesth* 2002;1:260-4.
2. Qureshi R, Ahmed SI, Raza A, Khurshid A, Chishti U. Obstetric patients in intensive care unit: Perspective from a teaching hospital in Pakistan. *JRSM Open* 2016; 7:2054270416663569.
3. Richa F, Karim N, Yazbeck P. Obstetric admissions to the intensive care unit: an eight-year review. *J Med Liban*. 2008;56:215–219.
4. Basket TF. Epidemiology of obstetric critical care. *Best Prac Res Clin Obstet*. 2008;22(5):763–774
5. Vasco M, Pandya S, Van Dyk D, Bishop DG, Wise R, Dyer RA. Maternal critical care in resource-limited settings. Narrative review. *Int J ObstetAnesth* 2019;37:86-95.
6. Ashraf N, Mishra SK, Kundra P, Veena P, Soundaraghavan S, Habeebullah S. Obstetric patients requiring intensive care: A one year retrospective study in a tertiary care institute in India. *Anesthesiol Res Pract* 2014;2014:789450.
7. Clark SL, Cotton DB, Hankins GO\; Phelan J~ Critical care obstetrics. 2nd ed. Boston: Blackwell Scientific Publications, 1991
8. Mabie VC, Sibai BM. Treatment in an obstetric intensive care unit. *Am J Obstet Gynecoll*1990; 162:1-4.
9. Mansour, M. B., & Ahmedana, S. E. . (2021). Statin use and Type 2 Diabetes Incidence. *Journal of Medical Research and Health Sciences*, 4(1), 1139–1145. <https://doi.org/10.15520/jmrhs.v4i1.306>
10. Ghazi A, Karim F, Hussain AM, Ali T, Jabbar S. Maternal morbidity in emergency versus elective caesarean section at tertiary care hospital. *J Ayub Med Coll Abbottabad* 2012;24:10-3.
11. Sullivan JM, Ramanathan KB. Management of medical problems in pregnancy-severe cardiac disease. *N Engl J ~ted* 1985; 313: 304-09
12. Brinkman CR. Biologic adaptation to pregnancy In: Creasy RK, Resnik R, eds. *Maternal fetal medicine: principles and practice*. Philadelphia: WB Saunders Co, 1989:734-45
13. Elrad H, Gleicher N. Physiologic changes in normal pregnancy In: Gleicher N, ed. *Principles of medical therapy in pregnancy* New York: Plenum Medical Book Co, 1985:33-56
14. Ueland K, Hansen JM. Maternal cardiovascular dynamics. *Am J OhstetGynecol* 1969; 103:8-18.